## General Description

The WSP4067C is the highest performance trench N-ch and P-ch MOSFET with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSP4067C meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

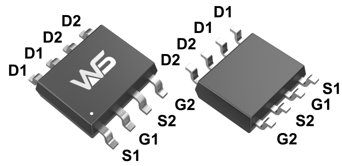
## Product Summery

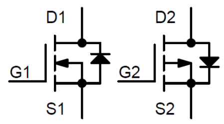
| BVDSS | RDSON | ID |
|---|---|---|
| 40V | 30mΩ | 5.8A |
| -40V | 62mΩ | -5.2A |

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter.
- Networking DC-DC Power System
- Load Switch

## SOP-8 Pin Configuration




## Absolute Maximum Ratings

| Symbol | Parameter | Rating | | Units |
|---|---|---|---|---|
| | | N-Channel | P-Channel | |
| $V_{DS}$ | Drain-Source Voltage | 40 | -40 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | ±20 | V |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 5.8 | -5.3 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 4.5 | -4.1 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 23 | -18 | A |
| EAS | Single Pulse Avalanche Energy[3] | 16 | 35 | mJ |
| $I_{AS}$ | Avalanche Current | 6.8 | -6.6 | A |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 1.67 | 1.67 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | 150 | 150 | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | --- | 75 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 55 | ℃/W |

## N-Channel Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 40 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | --- | 0.067 | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=4A | --- | 30 | 37 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=3A | --- | 40 | 50 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.0 | 1.5 | 2.5 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -5.24 | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=85℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=85℃ | --- | --- | 30 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=4A | --- | 8 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 3.4 | --- | Ω |
| $Q_g$ | Total Gate Charge (4.5V) | $V_{DS}$=15V , $V_{GS}$=4.5V , $I_D$=3A | --- | 5 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 1.54 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 1.84 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=20V , $V_{GS}$=10V , $R_G$=6Ω, $I_D$=1A ,$R_L$=20Ω | --- | 7.5 | --- | ns |
| $T_r$ | Rise Time | | --- | 2.2 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 30 | --- | |
| $T_f$ | Fall Time | | --- | 2.8 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=20V , $V_{GS}$=0V , f=1MHz | --- | 560 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 87 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 45 | --- | |

## Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| EAS | Single Pulse Avalanche Energy[5] | $V_{DD}$=20V , L=0.5mH , $I_{AS}$=6.8A | 12 | --- | --- | mJ |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,6] | $V_G$=$V_D$=0V , Force Current | --- | --- | 5.8 | A |
| $I_{SM}$ | Pulsed Source Current[2,6] | | --- | --- | 23 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=3A,$T_J$=25℃ | --- | --- | 1.1 | V |

Note :
1.The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper,t<10sec.
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3.The EAS data shows Max. rating . The test condition is $V_{DD}$=20V,$V_{GS}$=10V,L=0.5mH,$I_{AS}$=6.8A
4.The power dissipation is limited by 150℃ junction temperature
5.The Min. value is 100% EAS tested guarantee.
6.The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

## P-Channel Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | -40 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=-1mA | --- | -0.03 | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=-10V , $I_D$=-5.5A | --- | 62 | 75 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-3.5A | --- | 81 | 100 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}$ , $I_D$ =-250uA | -1.0 | -1.5 | -2.5 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 4.56 | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=-32V , $V_{GS}$=0V , $T_J$=85℃ | --- | --- | -1 | uA |
| | | $V_{DS}$=-32V , $V_{GS}$=0V , $T_J$=85℃ | --- | --- | -30 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=-5V , $I_D$=-4.5A | --- | 5.8 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 4.2 | --- | Ω |
| $Q_g$ | Total Gate Charge (-4.5V) | $V_{DS}$=-20V , $V_{GS}$=-10V , $I_D$=-5.5A | --- | 6.4 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 2.1 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 2.5 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=-20V , $V_{GS}$=-10V , $R_G$=6Ω, $I_D$=-1A,$R_L$=20Ω. | --- | 4.2 | --- | ns |
| $T_r$ | Rise Time | | --- | 23 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 27 | --- | |
| $T_f$ | Fall Time | | --- | 20 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-15V , $V_{GS}$=0V , f=1MHz | --- | 650 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 68 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 55 | --- | |

## Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| EAS | Single Pulse Avalanche Energy[5] | $V_{DD}$=-25V , L=0.5mH , $I_{AS}$=-6.6A | 12 | --- | --- | mJ |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,6] | $V_G=V_D$=0V , Force Current | --- | --- | -5.3 | A |
| $I_{SM}$ | Pulsed Source Current[2,6] | | --- | --- | -18 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | --- | --- | -1.1 | V |

Note :
1.The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper,t<10sec.
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3.The EAS data shows Max. rating . The test condition is $V_{DD}$=-20V,$V_{GS}$=-10V,L=0.5mH,$I_{AS}$=-6.6A
4.The power dissipation is limited by 150℃ junction temperature
5.The Min. value is 100% EAS tested guarantee.
6.The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

## N-Channel Typical Characteristics

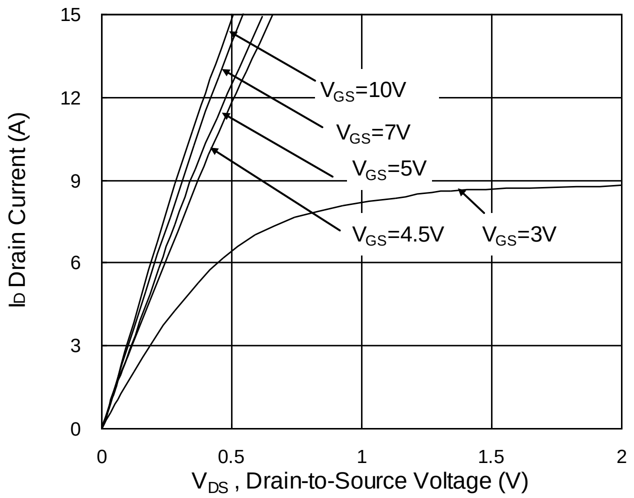



**Fig.1 Typical Output Characteristics**

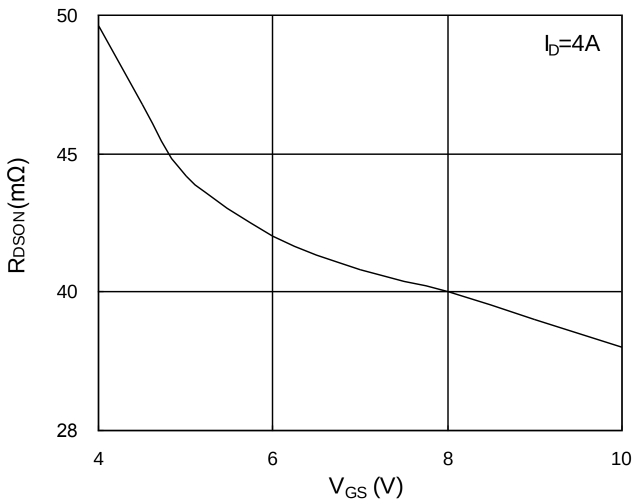



**Fig.2 On-Resistance vs. Gate-Source**

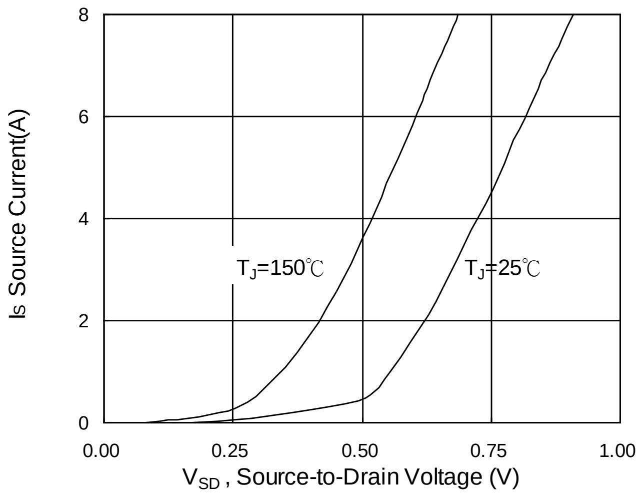



**Fig.3 Forward Characteristics Of Reverse**

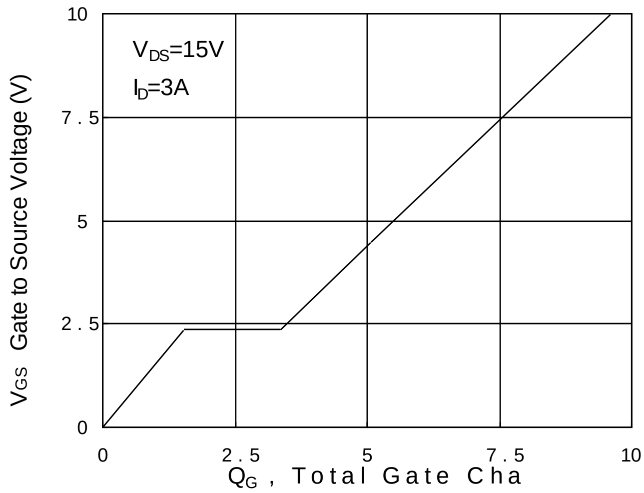



**Fig.4 Gate-Charge Characteristics**

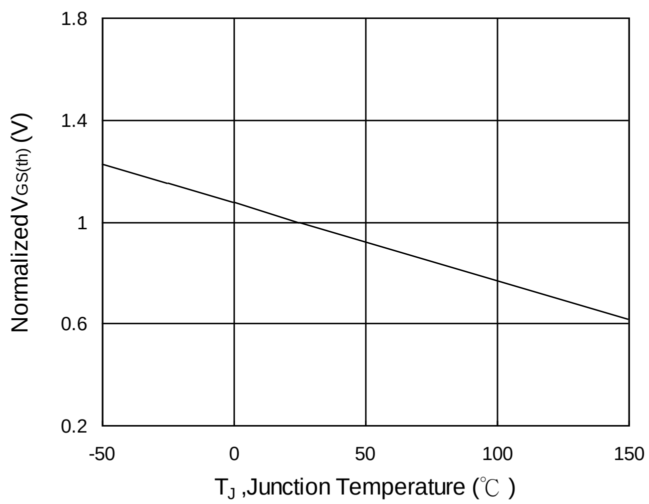



**Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$**

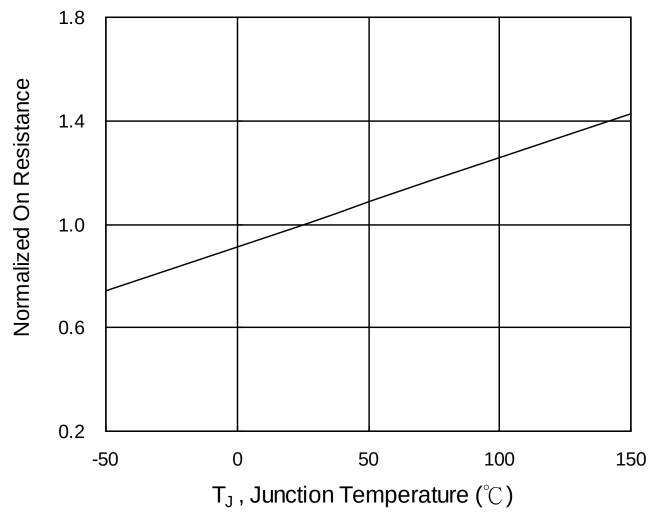



**Fig.6 Normalized $R_{DSON}$ vs. $T_J$**

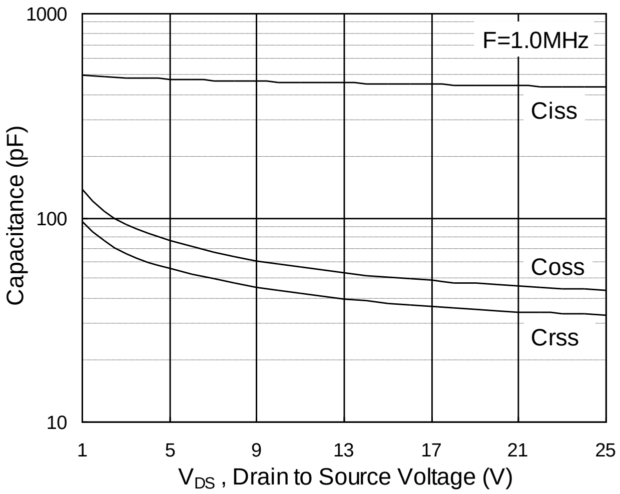



**Fig.7 Capacitance**

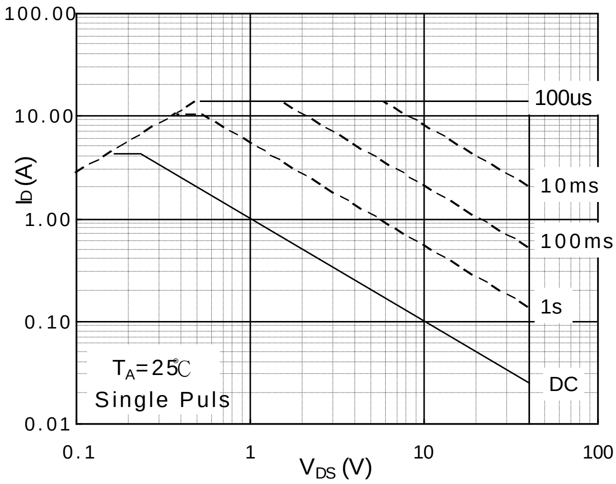



**Fig.8 Safe Operating Area**

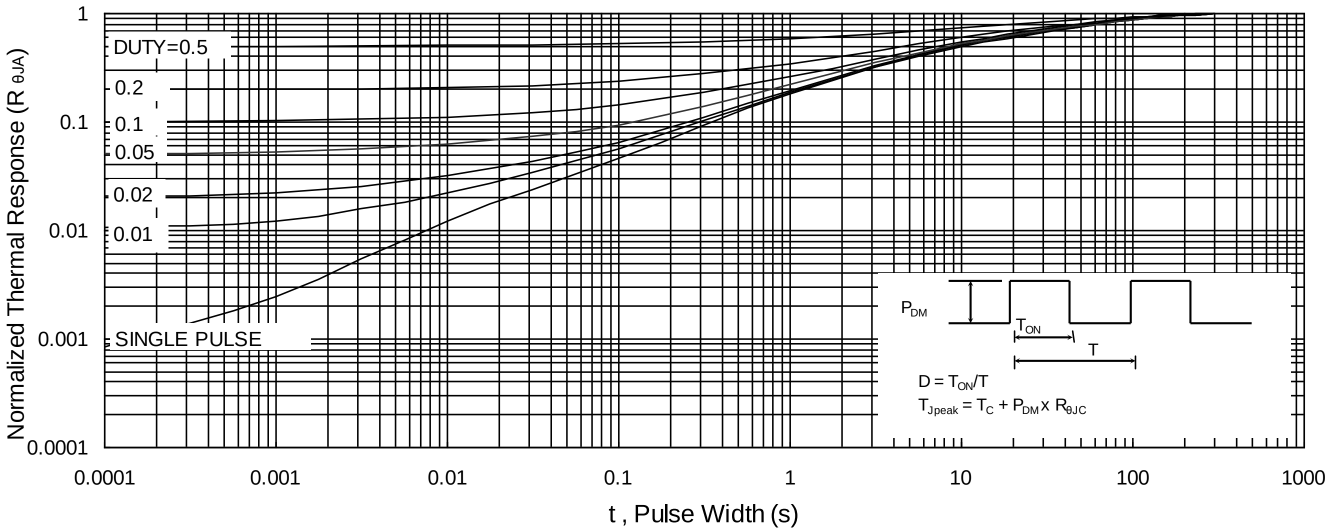



**Fig.9 Normalized Maximum Transient Thermal Impedance**

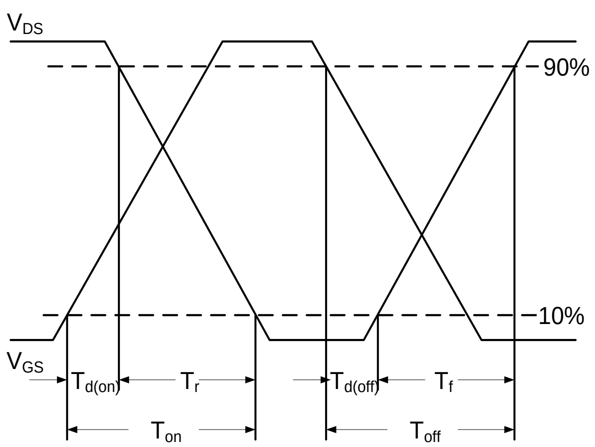



**Fig.10 Switching Time Waveform**

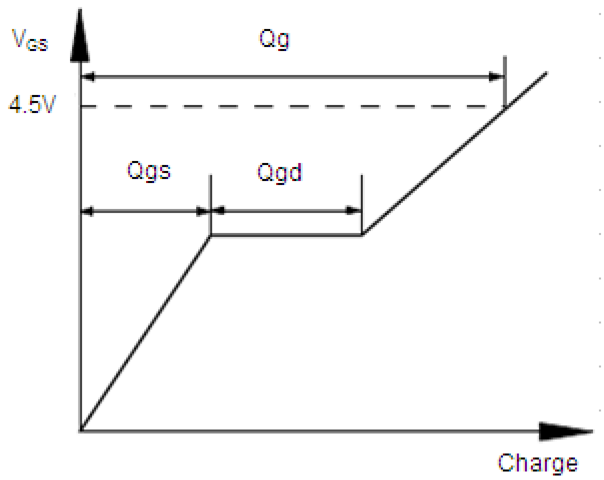



**Fig.11 Gate Charge Waveform**

## P-Channel Typical Characteristics

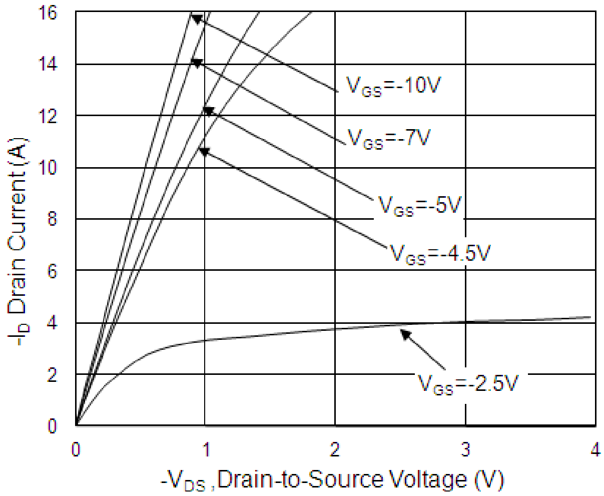



**Fig.1 Typical Output Characteristics**

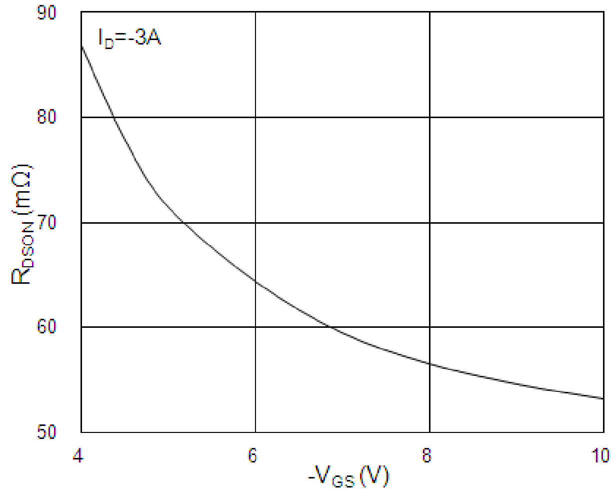



**Fig.2 On-Resistance vs. G-S Voltage**

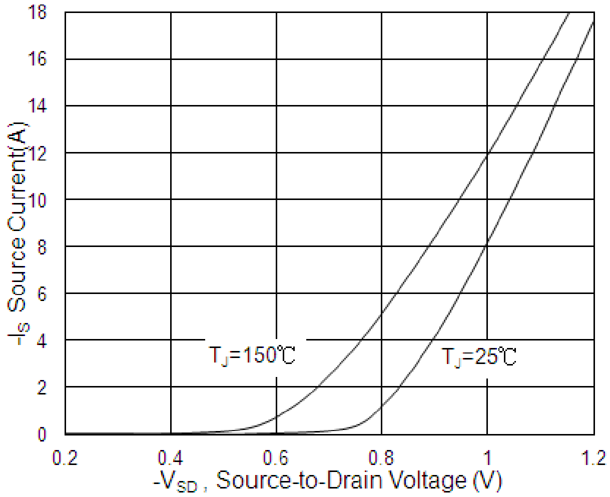



**Fig.3 Forward Characteristics Of Reverse**

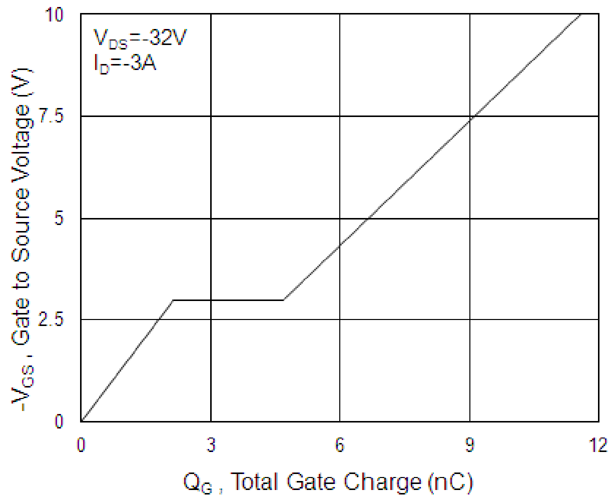



**Fig.4 Gate-Charge Characteristics**

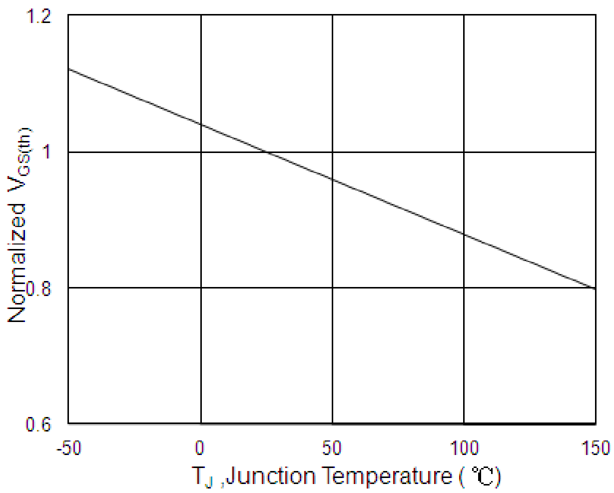



**Fig.5 Normalized $V_{GS(th)}$ vs.$T_J$**

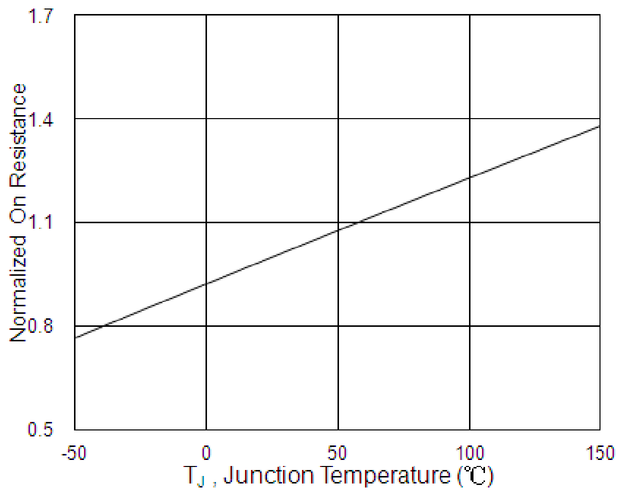



**Fig.6 Normalized $R_{DSON}$ vs. $T_J$**

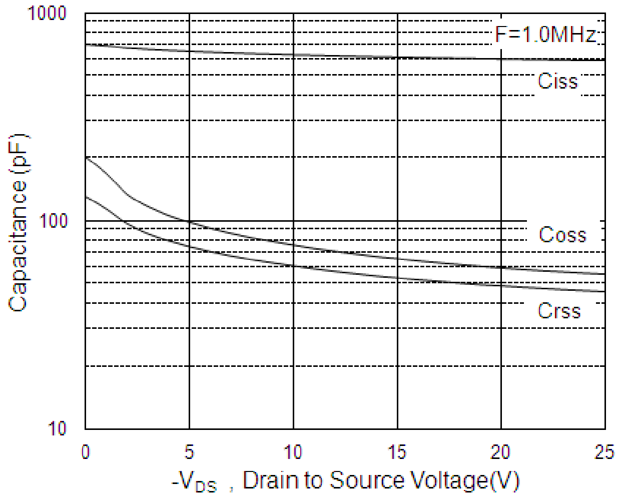



**Fig.7 Capacitance**

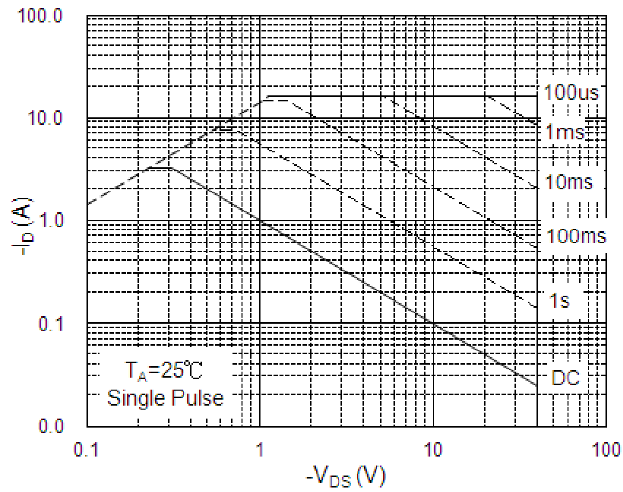



**Fig.8 Safe Operating Area**

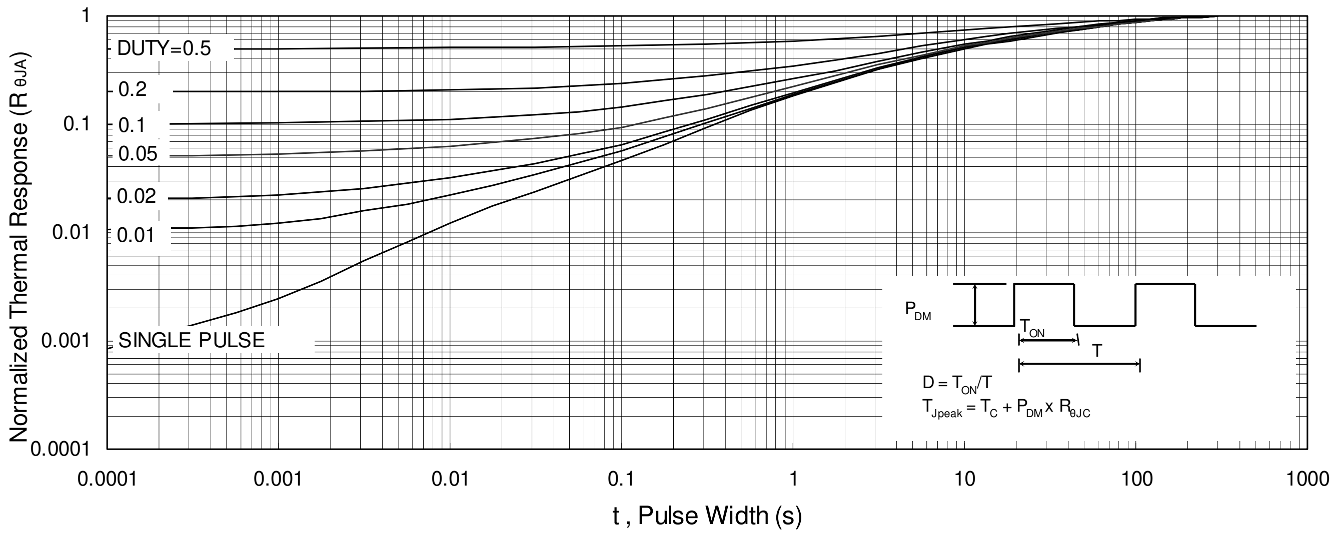



**Fig.9 Normalized Maximum Transient Thermal Impedance**

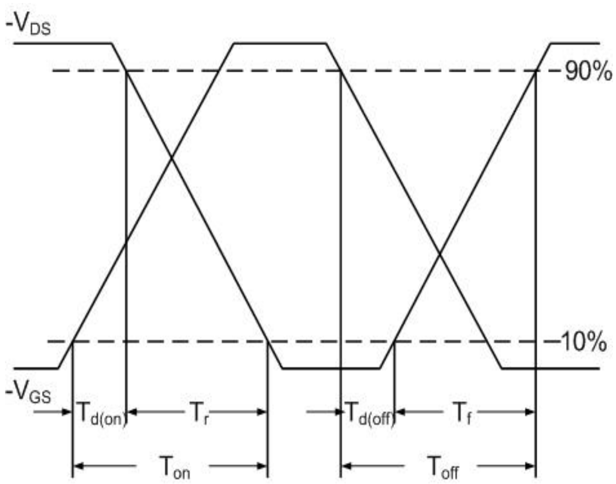



**Fig.10 Switching Time Waveform**

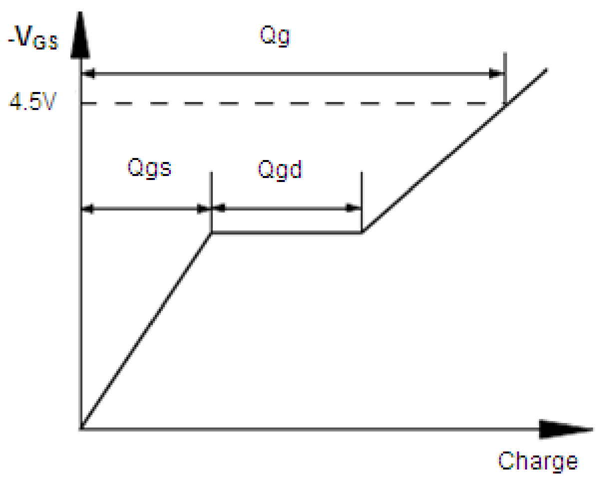



**Fig.11 Gate Charge Waveform**

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